

Biomolecular
Interaction Centre

building connections

ANNUAL REPORT 2014

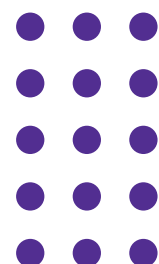




OUR MISSION

The Biomolecular Interaction Centre is a multi-disciplinary centre dedicated to the study of molecular interactions critical to biological function.

Understanding biomolecular interactions is central to a range of fundamental sciences, new treatments for disease, and a wide range of highly functional products. This gives us a variety of pathways through which we can connect to industry.



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THIS REPORT COVERS THE PERIOD 1 NOVEMBER 2013–31 OCTOBER 2014

Directors' Report

EVOLUTION AND EXPLORATION

The Biomolecular Interaction Centre was established in 2007 and is today a premier research cluster at the University of Canterbury, spanning the Colleges of Science and Engineering, including investigators from New Zealand's Crown Research Institutes and Universities, and Callaghan Innovation.

BIC has been in operation for 7 years now, and is entering a new phase in its development. We have transitioned from an institute relying primarily on internal funds to one where we raise a significant slice of our funding from external sources. We have also seen a major change in our leadership team, with two BIC stalwarts, Juliet Gerrard and Bill Swallow, moving on to new challenges.

The incoming leadership team have taken stock of our current activities, introducing several new initiatives that have brought the BIC community closer together, while at the same time looking to the horizon for emerging opportunities. This has resulted in a very exciting year, with several new research avenues being explored, notably around the themes of biomolecular computing and genomics applications, as complements to our established strengths at the interface of protein science, evolution, engineering and applied research.

BIC continues to grow its researcher base, with several new national AIs and adjuncts joining us in anticipation for our emergence as a distributed, national research entity, centred at the University of Canterbury. Our community has now grown to over 100 researchers, with 7 Principal Investigators, 35 AIs, 5 International Adjuncts, 10 postdoctoral scientists and more than 50 postgraduate students. We also continue to grow our links to New Zealand industry, facilitated by our close interactions with the Callaghan Innovation team. We are delighted to have a role in the Maurice Wilkins Centre and the MacDiarmid Institute.

We are confident that BIC rests on strong foundations, and that we will continue to build national momentum, both in our flagship research areas and in the developing research areas that we have been exploring in 2014.

Emily & Ant



**EMILY PARKER (DIRECTOR)
AND ANT POOLE (DEPUTY DIRECTOR)**
Biomolecular Interaction Centre



Income

BIOMOLECULAR INTERACTION CENTRE INCOME (ALL SOURCES)

	2013	2014*
UNIVERSITY INSTITUTE SUPPORT	\$349,946	\$470,453
EXTERNAL REVENUE	\$2,469,186	\$2,772,179
TOTAL	\$2,819,132	\$3,242,632

*FORECAST AS AT 31 OCTOBER 2014

**EXTERNAL
REVENUE
FOR 2014
CONTINUES
TO GROW**

Flagships

EVOLVING AND ENGINEERING BIOMOLECULES

FLAGSHIP LEADER –ANTHONY POOLE

As famed evolutionary biologist Theodosius Dobzhansky once said, 'Nothing in Biology makes sense except in the light of evolution'. That's exactly what we are finding in our study of molecular interactions at the subcellular level. We work on a wide range of topics, including how enzyme structure evolves and how this impacts enzyme activity, how RNA molecules evolve and coevolve with their interaction partners, and how evolution can be harnessed to engineer enzymes with novel properties.

We have had a strong year, with significant grant successes as well as some stellar papers.

RESEARCH HIGHLIGHTS

GENOMIC DARK MATTER UNEARTHED

RNA is typically thought of as a messenger molecule used in protein production. However, a new role is emerging for RNA as a key regulator that interacts with both genes and proteins to modulate gene expression. A big problem in building a full picture of the network of interactions required for gene expression is that finding these regulatory RNAs is non-trivial. An international team led by BIC Investigators Paul Gardner and Ant Poole, and including EU-funded postdoc Stinus Lindgreen and BIC/Bluefern PhD scholar Sinan Umu, have now developed a way of unearthing this so-called genomic dark matter. The team analysed over 400 transcriptomes from bacteria and archaea and showed that, to identify noncoding RNAs from a sea of transcripts, sampling is all-important. They found that comparing transcriptional outputs from different species can help reveal noncoding RNAs, but that this only works well if one samples the sweet-spot, where species are, in evolutionary terms, not-too-close and not-too-far apart. Utilising this 'Goldilocks zone', they netted on the order of 1000 novel RNAs, missed in genome annotations. Moreover, they found that these RNAs are among the most highly expressed transcriptional outputs in cells. This in turn suggests that bacteria and archaea may utilise regulatory RNAs to a similar degree to their eukaryotic cousins.

EVOLUTIONARY TRADE-OFFS AT HIGH TEMPERATURE

Studying an enzyme from the extreme hyperthermophile *Pyrococcus furiosus*, which grows optimally at 100°C, BIC postdoc, Ali Reza Nazmi, working with PIs Ren Dobson and Emily Parker and Massey-based AI, Geoff Jameson, have unearthed a remarkable evolutionary trade-off between structural stability and enzymatic activity. The enzyme 3-deoxy-D-arabino-heptulosonate 7-phosphate (DAH7P) from *Pyrococcus* normally exists as a tetramer. This structural organisation may help to stabilise the enzyme at the extreme temperatures, but the quaternary structure appears unrelated to enzymatic activity. To test this, the team made a mutation that weakened the tetramer, creating a variant enzyme that preferentially exists as a dimer. Surprisingly, this led to improved catalytic activity, despite the fact that the mutation was far from the enzyme's active site. The implication is that the tetrameric structure was key to adapting to extreme temperatures, but that this came at the expense of enzyme activity.

A SMALL SWITCH HAS A LARGE EFFECT ON AUTOPHAGY

Autophagy is the recycling system of the cell. BIC researchers Hironori Suzuki and Ren Dobson, with international collaborators from Japan (Photon Factory) and the US (Stanford University), published a featured article in *Cell Structure* that demonstrated the mechanism by which autophagy is regulated in human cells. The key finding was a mechanism that attenuated the affinity of the LC3 proteins to their cargo designated for recycling – it couldn't be too tight or too loose. The work was highlighted by Winfried Weissenhorn and Marie-Odile Fauvarque and graced the cover of the journal.





FLAGSHIP FUNDING SUCCESSES

PI Emily Parker was successful in securing Marsden Funding from the Royal Society of New Zealand to study a stunning case of enzyme regulation. Her grant is entitled: Allosteric regulation and the dynamics of a molecular pendulum that controls a catalytic clock.

PI Ant Poole secured international funding from the Japan Society for the Promotion of Science to work with Prof. Jun Ogawa's group at Kyoto University. Their grant is entitled: Rewiring life: addressing the origin of life and improving industrial processes by resurrecting an ancient pathway for DNA synthesis.

HIGH-PROFILE INTERNATIONAL COLLABORATIONS BEAR FRUIT

Two high profile publications, published in the prestigious Proceedings of the National Academy of Sciences, include contributions by BIC scientists.

A key pseudokinase unleashes the four-helix bundle domain to induce necroptotic cell death.¹

This work is led by BIC AI and UC Alumnus James Murphy at the Walter Elisa Hall Institute (Melbourne), who has a long-standing collaboration with Ren Dobson. The work, presented in the prestigious journal PNAS, uncovers the molecular mechanisms by which a new pathway to cell death is activated—necroptosis. The key protein is MLKL, a pseudokinase that is a trimer in the cell until it is activated, upon which the protein forms a larger species that locates to the cell membrane. Key data that established this finding was collected at New Zealand Centre for Analytical

Ultracentrifugation, housed at the University of Canterbury. In addition to unearthing this mechanism, a small molecule inhibitor was discovered that blocks MLKL activation and necroptosis, providing an important proof-of-principle that targeting catalytically dead pseudoenzymes represents a feasible, emerging therapeutic avenue.

Back from the dead: bacteria can and do incorporate DNA from dead organisms.²

Our environment is awash with DNA, but we tend to assume that, once organisms die, its genetic material slowly degrades. However a study published in PNAS, which included contributions by BIC PI Ant Poole, shows that bacteria can take up and environmental sources of damaged DNA and incorporate it into their genomes. To be sure that what they were observing was not a result of some form of contamination, the team made use of damaged DNA fragments from an extinct woolly mammoth, and found that this was taken up and stitched into the genome of the bacterium *Acinetobacter baylyi*. This discovery has the potential to rewrite our view of evolution, because it means that ancient sources of DNA from extinct organisms can find their way back into living lineages via this process.

1. Hildebrand, Tanzer, Lucet, Young, Spall, Sharma, Pierotti, Garnier, Dobson, Webb, Tripaydonis, Babon, Mulcair, Scanlon, Alexander, Wilks, Czabotar, Lessene, Murphy, Silke (2014) Activation of the pseudokinase MLKL unleashes the four-helix bundle domain to induce membrane localization and necroptotic cell death. PNAS 111(42):15072-7.
2. S. Overballe-Petersen, K. Harms, L. A. A. Orlando, J. V. Moreno Mayar, S. Rasmussen, T. W. Dahl, M. T. Rosing, A. M. Poole, T. Sicheritz-Pontén, S. Brunak, W. Wackernagel, S. Inselmann, J. de Vries, O. Pybus, R. Nielsen, P. J. Johnsen, K. M. Nielsen, E. Willerslev, Bacterial natural transformation by highly fragmented and damaged DNA. Proceedings of the National Academy of Sciences of the United States of America, 110, 19860-19865 (2013).

ENGINEERING BIOTECHNOLOGY

FLAGSHIP LEADER - DR VOLKER NOCK

We aim to connect basic biotech research with innovative applications driven by engineering technology. We are focusing on the following broad areas of activity: 3D printed devices for bioseparation, biomolecular interactions on engineered surfaces, biomolecular interactions related to disease detection and therapy, development of lab-on-a-chip platforms for biochemistry and sourcing of advanced materials from nature's pantry.

In a drive to increase cross-disciplinary research activities, two major projects are currently being funded under the Flagship programme.

RESEARCH HIGHLIGHTS

A MICROFLUIDIC DEVICE FOR MONITORING BIOMOLECULAR INTERACTIONS IN COMPLEX SOLUTIONS (EVEN COLLOIDS)

There is a world of difference between a protein in a buffered dilute solution and the inside of a cell—particularly when thinking about how proteins interact with their surroundings. BIC PIs Volker Nock and Ren Dobson have set out to design a device that characterises interactions in real time and in complex solutions, similar to the contents of a cell. This is in many respects the Holy Grail for those interested in characterising biologically realistic biomolecular interactions. BIC Postdoctoral Fellow Dr Mangayarkarasi Nivaskumar and PhD student Louise Orcheston-Findlay have already developed the prototype device and done the first proof-of-principle experiments with green fluorescent protein.

NEXT-GENERATION BIOADHESIVE DEVELOPMENT FOR MEDICAL IMPLANTS

Members of the Dimartino and Nock groups are harnessing the capacity of marine organisms like mussels and barnacles to adhere to surfaces for development of next-generation bioadhesives and anti-fouling surfaces. Using nanofabrication to generate patterned surfaces the adhesion force of marine organisms is estimated. Once adhesion is characterized, these surfaces can then be used to prevent marine biofouling and develop new biomimetic adhesives. The team hopes that these adhesives will be able to aid in the reconstruction of tissues and medical implantation.

3D PRINTING OF NOVEL MATERIALS

PI Conan Fee, AI Simone Dimartino and Don Clucas are making strong progress on their MBIE-funded Smart Idea project to develop 3D printed adsorptive media. By harnessing high-resolution 3D printing techniques, the team is in the process of developing materials with efficient packing geometries, something which was previously impossible. Their \$1 million research programme is currently centred on adsorptive media, and this approach to creating porous structures could have applications in air filtration, catalysis, improving fuel consumption efficiency and drug delivery. Their work has already garnered significant international interest, and their first application of this technology is well underway, with their work on new chromatographic columns published earlier this year.





FROM INTERACTION TO APPLICATION

FLAGSHIP LEADER - DR ANTONIA MILLER

An established strength of BIC is our capacity to take ideas from the research lab and into the real world. Our relationship with the Protein Science Team from Callaghan Innovation continues to be productive, and we have worked to widen the interactions between BIC scientists and industry. To that end, we have developed a number of initiatives to support BIC researchers to evaluate their current and future research in the context of application to industry. For example seed funding has been made available by BIC for its investigators to either develop research programmes, ideas and collaborations in applied areas, or conduct specific freedom to operate searches. It is anticipated that this seed funding will lead to the generation of strongly competitive collaborative applied research grant applications and engagement with industry.

RESEARCH HIGHLIGHTS

NEW BIOMARKER PRODUCTS FOR EARLY DIABETES DIAGNOSTICS

BIC PI Ren Dobson, together with Professor Juliet Gerrard and Professor Antony Fairbanks, is leading a \$1 million MBIE Smart Ideas research programme that marries

academic know-how with industry can-do. Dobson's team is collaborating closely with Canterbury Scientific Ltd, a Christchurch-based diagnostics company, to develop a new range of biomarker products for early detection of individuals at risk of developing diabetes.

IMPROVING DIGESTIVE HEALTH WITH BIOACTIVE KIWIFRUIT PROTEINS

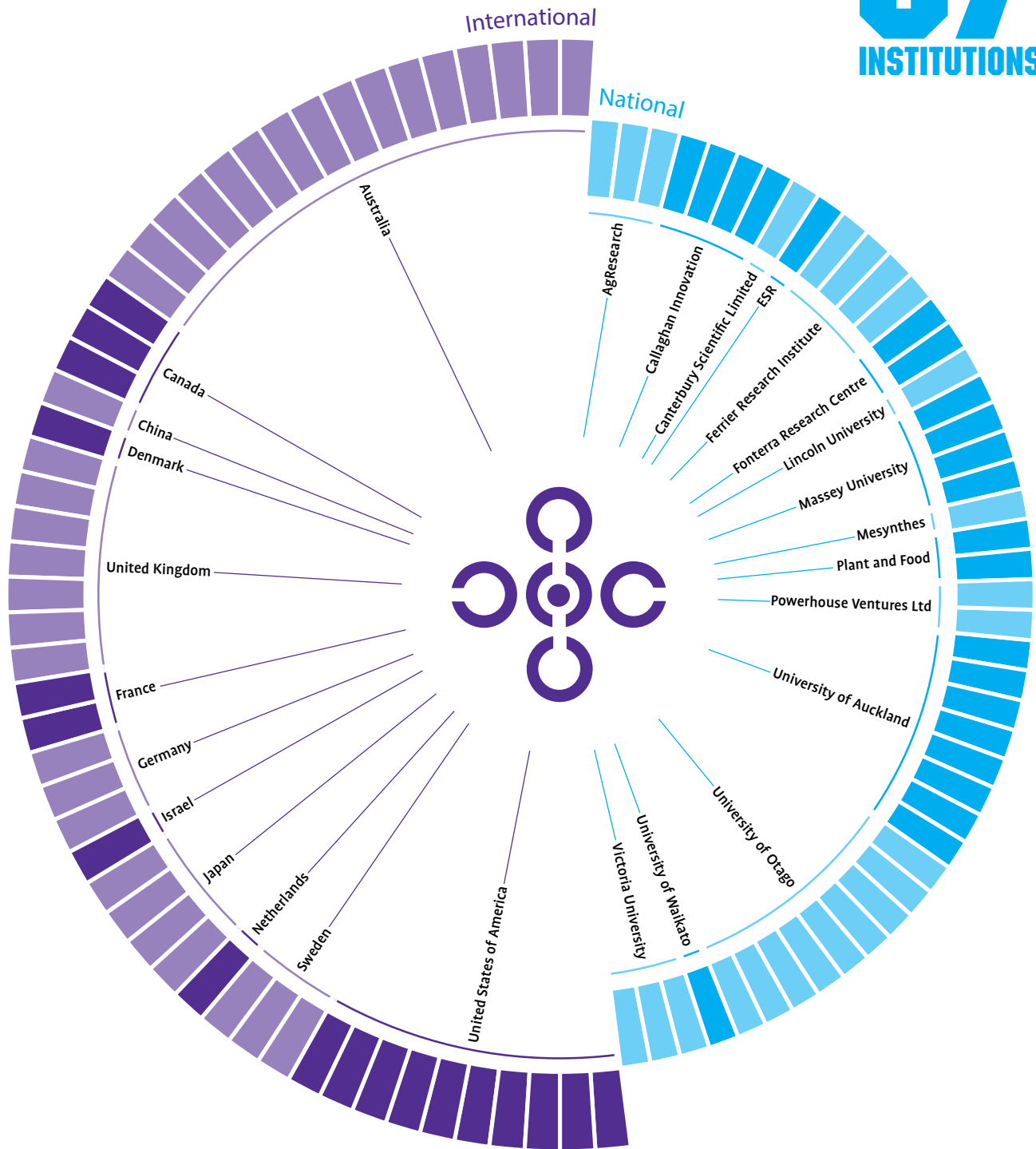
BIC PI Grant Pearce has been leading a collaborative project between his team, Callaghan Innovation and Anagenix, a New Zealand biotech company, to harness proteases naturally found in kiwifruit for improvement of digestive health. As part of this work, MSc student Eric Richards gained valuable experience into how to bridge the gap between university research environments and the frenetic pace of commercial biotech.

FLAGSHIP FUNDING SUCCESS

Matthew Nicholson and Emily Parker have secured a MBIE Smart idea to investigate the manufacture of high value industrial bioproducts with fungal factories. Indole diterpenes are a diverse group of fungal-derived compounds. These compounds display a wide variety of potent bioactivities against insects, various cancers, multidrug-resistant bacteria and H1N1 influenza. The manufacture of these compounds requires highly complex cellular machinery. The MBIE project will build on our detailed understanding of the key machinery possessed by the fungi for the production of these compounds to construct new fungal factories. These fungal factories will enable the production of natural products with applications in agriculture, animal health and pest control.

Our networks

CONNECTING
57
INSTITUTIONS



Biotelliga

Our network continues to grow. Emily Parker, together with Matthew Nicholson, are leading an emerging relationship with Biotelliga, is a growing New Zealand company. They produce biological, sustainable, non-synthetic chemical based crop protection solutions for the effective management and control of pests and diseases. This collaboration supports this year's successful MBIE-funded Smart Idea project to the manufacture of high value industrial bioproducts with fungal factories.

AGRESEARCH

Jolon Dyer, Lincoln

Stefan Clerens, Lincoln

Ali Hodgkinson, Ruakura

BIOTELLIGA

Stephen Ford

CALLAGHAN INNOVATION

Antonia Miller, Christchurch

Andrew Muscroft-Taylor, Christchurch

Leonardo Negron, Lower Hutt

Michael Steward, Christchurch

CANTERBURY SCIENTIFIC LIMITED

Maurice Owen

INSTITUTE OF ENVIRONMENTAL SCIENCE & RESEARCH (ESR)

Brent Gilpin

FERRIER RESEARCH INSTITUTE

Gary Evans

Richard Furneaux

Peter Tyler

Phillip Rendle

FONTERRA RESEARCH CENTRE

Paul Andrewes

Skelte Anema

LINCOLN UNIVERSITY

Jim Morton

MASSEY UNIVERSITY

Jane Allison, Auckland

Austen Ganley, Auckland

Geoff Jameson, Palmerston North

Bill Williams, Palmerston North

MESYNTHES

Barney May

PLANT AND FOOD

Nigel Larsen

Nick Tucker

POWERHOUSE VENTURES LTD

Matt Jones

Jennifer Anderson

UNIVERSITY OF AUCKLAND

Margaret Brimble

Juliet Gerrard

David Goldstone

Shaun Lott

Alok Mitra

Chris Squire

Jadranka Travas-Sejdic

David Williams

UNIVERSITY OF OTAGO

Stephen Brennan, Christchurch

Greg Cook

Monica Gerth

Mark Hampton, Christchurch

Tony Kettle, Christchurch

Kurt Krause

Jim McQuillan

Wayne Patrick

Tim Woodfield, Christchurch

UNIVERSITY OF WAIKATO

Vic Arcus

VICTORIA UNIVERSITY

David Ackerley

Petrik Galvosas

Kate McGrath



AUSTRALIA

Ashley Buckle, Monash University, Melbourne

John Carver, ANU, Canberra

John Fuerst, University of Queensland, Brisbane

Sally Gras, Bio21

Michael Griffin, University of Melbourne, Melbourne

Danny Hatters, Bio21, Melbourne

Craig Hutton, Bio21, Melbourne

Jenny Martin, University of Queensland, Brisbane

Bridget Mabbutt, Macquarie University, Sydney

Joel Mackay, University of Sydney, Sydney

Bostjan Kobe, University of Queensland, Brisbane

James Murphy, Walter and Eliza Hall Institute, Melbourne

Matt Perugini, La Trobe University, Melbourne

Rachael Williamson, Australian Synchrotron, Melbourne

Celine Valery, RMIT, Melbourne

Claudia Vickers, University of Queensland, Brisbane

CANADA

John Archibald, Dalhousie University, Nova Scotia

Karen Cheung, University of British Columbia, Vancouver

Derek Wilson, York University

CHINA

Wenhui Wang, Tsinghua University, Beijing

DENMARK

Eske Willerslev, Copenhagen University, Copenhagen

FRANCE

Simonetta Gribaldo, Institut Pasteur, Paris

Claude Verdier, University Joseph Fourier, Grenoble

GERMANY

Muge Kasanched, Max Planck Institute for Biophysical Chemistry

Haydyn Mertens, EMBL, Hamburg

Gerald Urban, University of Freiburg, Freiburg

ISRAEL

Meir Haber, Biota

JAPAN

Eiji Morita, Osaka University, Osaka

Jun Ogawa, Kyoto University, Kyoto

Hironori Suzuki, Japan

Robert Sinclair, Okinawa Institute of Science & Technology, Okinawa

NETHERLANDS

Luigi Sasso, Delft University of Technology

SWEDEN

Rosmarie Friemann, University of Gothenburg

Richard Neutze, University of Gothenburg

Britt-Marie Sjöberg, Stockholm University, Stockholm

UNITED KINGDOM

Sean Devenish, University of Cambridge, Cambridge

Carol Robinson, University of Oxford, Oxford

Graham Richards, University of Oxford, Oxford

Colin Kleanthous, University of Oxford, Oxford

Adrian Mulholland, University of Bristol

Nick Thomson, Wellcome Trust Sanger Institute, Cambridge

Jerry Turnbull, University of Liverpool, Liverpool

UNITED STATES OF AMERICA

David Boehr, Pennsylvania state university

Tim Cooper, University of Houston, Houston

Laura Domigan, Tufts University, Boston

Andre Hudson, Rochester Institute, New York

Eileen Jaffe, Fox Chase Cancer Center, Philadelphia

David Kaplan, Tufts University, Boston

Thomas Laue, University of New Hampshire, Durham

George Lorimer, University of Maryland, Washington

Charlene Mello, University of Massachusetts, Boston

Vern Schramm, Albert Einstein College of Medicine, New York



novation

Calla

Callaghan Innovation

Changing of the guard



THIS YEAR, WE SAID FAREWELL TO PROFESSOR JULIET GERRARD AND PROFESSOR BILL SWALLOW.

Bill stood down as a BIC PI in January 2014. He has been a leading light in helping our scientists engage with Industry, and has played an important leadership role in BIC during the Centre's inception, as a Theme leader, and through his role as UC's entrepreneur-in-residence. We wish him well in his retirement.

Juliet has accepted a joint Professorial position in the Schools of Biological Sciences and Chemical Sciences, at The University of Auckland, which she took up in October.

Both Juliet and Bill were instrumental in building BIC into the successful centre it is today. Together with Emily Parker and Conan Fee, they successfully applied for the initial TEC investment in 2007 that enabled us to purchase the key equipment that marked the beginnings of BIC. They were also central to our successful 2009 application to the University for Institute funding, which gave us five years' funding to build a strong research environment.

Juliet has been central to the BIC leadership throughout, acting as Co-Director (1 April 2010 – 31 March 2013) and then as Director (1 April 2013 – 31 March 2014). During that time, she nurtured a strong relationship with Callaghan Innovation, leading to Callaghan Innovation's decision to move its Protein Science and Engineering team to UC. She has also been behind many of our major MBIE grant successes, mentoring our emerging scientists through the tricky process of securing competitive funds.

While we are all sad to see Juliet go, there is always a silver lining – we are pleased to announce that Juliet has agreed to continue her involvement in BIC as a PI, which marks BIC's beginnings as a national institute. In the coming year we will be looking to build a strong national presence, and hope to add to our pool of national PIs.



Our growing capability



NICOLA BLACKMORE

EXPLOITING ENZYMES FOR DRUG DESIGN

Lottery Health Postdoctoral Fellow Nicola Blackmore undertook her PhD project, under the supervision of Professor Emily Parker at the University of Canterbury, with funding support from the Maurice Wilkins Centre. Her thesis investigated the regulatory behaviour of a key enzyme, 3-deoxy-3-deoxy-D-*arabino*-heptulosonate 7-phosphate (DAH7P) synthase, from *Mycobacterium tuberculosis* which is the causative agent for the infectious disease Tuberculosis. DAH7P synthase is an enzyme critical for the biosynthesis of the aromatic amino acids in plants and microorganisms.

She is continuing to work with Emily Parker's group on a different project investigating another critical metabolic enzyme, ATP-phosphoribosyltransferase, involved in the biosynthesis of histidine.

Nicola's projects provide insights that are aimed towards the development of novel antibiotics for *M. tuberculosis* and other bacterial pathogens.



PATRICK KEARNEY

GROWING ENZYME SCAFFOLDS

Amyloid fibrils are a protein structure that are enjoying a lot of attention at present. In the body they are associated with diseases like Alzheimer's but the same biochemical properties that make them pathological *in vivo* make them interesting for *de novo* bionanotechnologies. The fibrils I'm studying have a high tensile strength, are stable across a large range of temperature and pH and are resistant to enzyme degradation. The lysine residues on the surface allow crosslinking so we are investigating using the fibrils as a scaffold for immobilising enzymes. In particular I'm looking at the formation and growth of these fibrillar structures and the extent to which it is possible to control their behaviour and geometry when patterning them onto a surface.



JENNIFER GROWTHER

UNDERSTANDING PROTEINS TO AID MANUFACTURING OPTIMISATION

Jennifer is working on an AgResearch MBIE-funded PhD project examining the physicochemical properties of beta-lactoglobulin (Blg) from goats' milk. This protein is implicated in the processing, digestion and allergenicity of ruminant milks. Goat milk appears to have a lesser allergenic burden and to be more easily digested than cows' milk, which may be explained by differences in the properties of the cow and goat orthologues of Blg. Understanding the properties of goat Blg will also contribute to optimisation of the manufacturing processes of goat milk products.

"The opportunity to undertake academic research with an industrial application is particularly beneficial as it will provide me with valuable experience for whichever direction I choose to take my career."

Our people

PRINCIPAL INVESTIGATORS



PROFESSOR EMILY PARKER



ASSOCIATE PROFESSOR ANTHONY POOLE



PROFESSOR CONAN FEE



DR RENWICK DOBSON



DR VOLKER NOCK



DR GRANT PEARCE



PROFESSOR JULIET GERRARD

ADVISORY BOARD

Professor Edward Baker, Chair

Dr Richard Furneaux, Deputy Chair

Professor Peter Hunter

Professor David Beebe

MANAGEMENT STAFF

Dr Susie Meade

TECHNICAL STAFF

Ms Rayleen Fredericks

Mrs Jackie Healy

ASSOCIATE INVESTIGATORS

Dr David Ackerley, School of Biological Sciences, Victoria University

Dr Jane Allison, Centre for Theoretical Chemistry and Physics, Massey University

Prof Vic Arcus, Department of Biological Sciences, University of Waikato

Prof Stephen Brennan, Molecular Pathology laboratory, Canterbury Health Laboratories

Prof Mark Billingham, HITLAB, UC

Dr Stefan Clerens, Food and Bio-Based Products, AgResearch

Dr David Collings, School of Biological Sciences, UC

Dr Deb Crittenden, Chemistry Department, UC

Dr Simone Dimartino, Chemical & Process Engineering, UC

Dr Jolon Dyer, Food and Bio-Based Products, AgResearch

Dr Gary Evans, Ferrier Research Institute, Victoria University

Prof Antony Fairbanks, Chemistry Department, UC

Dr Paul Gardner, School of Biological Sciences, UC

Dr Monica Gerth, Department of Biochemistry, University of Otago

Dr Brent Gilpin, Institute of Environmental Science & Research

Assoc Prof Pete Gostomski, Chemical & Process Engineering, UC

Prof Mark Hampton, Centre for Free Radical Research, University of Otago

Assoc Prof Richard Hartshorn, Chemistry Department, UC

Prof Geoff Jameson, Institute of Fundamental Sciences, Massey University

Prof Tony Kettle, Centre for Free Radical Research, University of Otago

Dr Nigel Larsen, Plant and Food Research

Dr Shaun Lott, School of Biological Sciences, University of Auckland

Dr Aaron Marshall, Chemical & Process Engineering, UC

Assoc Prof Ken Morison, Chemical & Process Engineering, UC

Dr Antonia Miller, Protein Science and Engineering Team, Callaghan Innovation

Assoc Prof Jim Morton, Lincoln University

Dr Andrew Muscroft-Taylor, Protein Science and Engineering Team, Callaghan Innovation

Dr Wayne Patrick, Department of Biochemistry, University of Otago

Dr Phillip Rendle, Ferrier Research Institute, Victoria University

Prof Ian Shaw, Chemistry Department, UC

Dr Mark Staiger, Mechanical Engineering Department, UC

Dr Michael Steward, Protein Science and Engineering Team, Callaghan Innovation

Dr Peter Tyler, Ferrier Research Institute, Victoria University

Dr Arvind Varsani, School of Biological Sciences, UC

Dr Gabriel Visnovsky, Chemical & Process Engineering, UC

Dr Tim Woodfield, Department of Orthopaedic Surgery and Musculoskeletal Medicine, University of Otago

BIG ADJUNCTS

ADJUNCT PROFESSOR

Prof Stephen Brennan, University of Otago

Prof Juliet Gerrard, University of Auckland

Prof Geoff Jameson, Massey University

Prof Richard Neutze, University of Gothenburg, Sweden

Prof Carol Robinson, Oxford University, England

ADJUNCT ASSOCIATE PROFESSOR

Dr Jolon Dyer, AgResearch Ltd

Dr Nigel Larsen, Plant & Food Research Ltd

Assoc Prof Jim Morton, Lincoln University

Dr James Murphy, Walter and Eliza Hall Institute of Medical Research, Australia

ADJUNCT SENIOR FELLOW

Dr Brent Gilpin, Environmental Science & Research

Dr Antonia Miller, Callaghan Innovation

Dr Andrew Muscroft-Taylor, Callaghan Innovation

Dr Phillip Rendle, Ferrier Research Institute, Victoria University

Dr Michael Steward, Callaghan Innovation

Dr Hironori Suzuki, Japan

ADJUNCT FELLOW

Dr Leonardo Negron, Callaghan Innovation

Dr Luigi Sasso, Delft University of Technology, The Netherlands

Dr Rachel Williamson, Australian Synchrotron

POSTDOCTORAL FELLOWS AND RESEARCH STAFF

Dr Karen Adair, Associated with Anthony Poole's group

Dr Nicola Blackmore, Associated with Emily Parker's group

Dr Ryan Catchpole, Associated with Anthony Poole's

Dr Justine Cottam, Associated with Juliet Gerrard's group

Dr Penel Cross, Associated with Emily Parker's group

Dr Tim Huber, Associated with Conan Fee's group

Dr Wanting Jiao, Associated with Emily Parker's group



Dr Dmitri Joseph, Associated with Emily Parker's group

Dr Muge Kasanmascheff, Associated with Renwick Dobson's group

Dr Sarah Kessans, Associated with Renwick Dobson's group

Dr Moritz Lasse, Associated with Ren Dobson's group

Dr Stinus Lindgreen, Associated with Anthony Poole's

Dr Angela Newton, Associated with Juliet Gerrard's group

Dr Luigi Sasso, Associated with Juliet Gerrard's group

Annette Steward, Associated with Emily Parker's group

Dr Ali Reza Nazmi, Associated with Juliet Gerrard's group

Dr Hironori Suzuki, Associated with Renwick Dobson's group

Dr Céline Valéry, Associated with Juliet Gerrard's group

Dr Madhu Vasudevamurthy, Associated with Juliet Gerrard's group

Mathieu Vilmy, Associated with Conan Fee's group

POSTGRADUATE STUDENTS

Shakil Arif – PhD, with Emily Parker

Fatemeh Ashari Ghomi – PhD, with Paul Gardner

Helen Ashmead – PhD, with Juliet Gerrard, in partnership with Callaghan Innovation

Yu Bai – PhD, with Emily Parker

Nicola Blackmore – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre

Neha Chandrasekaran – PhD, with Conan Fee & Simone Dimartino

Shradha Chandrasekaran – PhD, with Conan Fee & Simone Dimartino

Tammie Cookson – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre

Jennifer Crowther – PhD, with Renwick Dobson, in partnership with AgResearch

Fabian Dolamore – PhD, with Conan Fee & Simone Dimartino, in partnership with MBIE

Katherine Donovan – PhD, with Renwick Dobson

Emma Dorsey – MSc, with Renwick Dobson

Hisham Eldai – PhD, with Paul Gardner

Yifei Fan – BSc (Hons), with Emily Parker

Dylan Gifford, MSc, with Grant Pearce

Letitia Gilmour – MSc, with Renwick Dobson, in association with Canterbury Scientific Ltd

Fiona Given – PhD, with Emily Parker

Anne Gordon – PhD, with Conan Fee & Simone Dimartino, in partnership with MBIE

Azadeh Hashemi – PhD, with Volker Nock & Maan Alkaisi

Logan Heyes – PhD, with Emily Parker

Michael Hunter – PhD, with Emily Parker

Amanda Inglis – MSc, with Emily Parker, in partnership with ESR

Dmitri Joseph – PhD, with Emily Parker, in partnership with the Maurice Wilkins Centre

Janadari Kariyawan – PhD, with Richard Hartshorn

Manmeet Kaur – PhD, with Juliet Gerrard, in partnership with MBIE

Patrick Kearney – MSc, with Volker Nock, Luigi Sasso & Conan Fee

Jeremy Keown – PhD, with Grant Pearce

Sam Kim – PhD, with Juliet Gerrard, in partnership with Callaghan Innovation

Alicia Lai Sook Wei – PhD, with Anthony Poole

Eric Lang – PhD, with Emily Parker, in partnership with the BlueFern

Alex Law – MSc, with Renwick Dobson

Wenting Liu – PhD, with Anthony Poole

Emma Livingstone – MSc, with Emily Parker

Deepti Mahapatra – PhD, with Renwick Dobson, Jolon Dyer & Juliet Gerrard, in partnership with AgResearch

Ashar Malik – PhD, with Jane Allison (Massey) & Anthony Poole

Anton Mather – MSc, with Simone Dimartino

Gerd Mittelstädt – PhD, with Emily Parker

Gert-Jan Moggré – PhD, with Emily Parker, in partnership with the Ferrier Research Institute

Suhas Nawada – PhD, with Conan Fee & Simone Dimartino, in partnership with CAPE

Angela Newton – PhD, with Juliet Gerrard, in partnership with Fonterra

Vi-Vie Ng – PhD, with Volker Nock & Mathieu Sellier

Rachel North – PhD, with Renwick Dobson

Victoria O’Leary – MSc, with Richard Hartshorn, in partnership with AgResearch

Michael Oliver – BSc (Hons), with Renwick Dobson

Thomas Orban – PhD, with Renwick Dobson, in partnership with MBIE and Canterbury Scientific Ltd

Louise Orcheston-Findlay – PhD, with Volker Nock

Mohamad Othman – MSc, with Emily Parker

Rishi Pandey – PhD, with Grant Pearce, Jolon Dyer, Celine Valéry & Juliet Gerrard, in partnership with AgResearch,

Amy Phillips – PhD, with Juliet Gerrard, in partnership with MacDiarmid

Prasanna Ponnumallayan – PhD, with Conan Fee

Nivaskumar Ramaswamy – PhD, with Grant Pearce

Arvind Ravichandran – PhD, with Renwick Dobson

Roya Rezanavaz – PhD, with Conan Fee & Simone Dimartino

Eric Richards - Grant Pearce, in partnership with Callaghan Innovation and Anagenix

Alannah Rickerby – MSc, with Anthony Poole

Jordyn Smith – MSc, with Emily Parker

Balaji Somasundaram – PhD, with Conan Fee

Anja Stampfli – BSc (Hons), with Emily Parker

Oliver Sterrit – MSc, with Emily Parker

Kannan Subramanian – PhD, with Conan Fee & Simone Dimartino, in partnership with the Wakefield Institute

Xiaoli Sun – PhD, with Juliet Gerrard, in partnership with Fonterra

Ryu Toyama – MSc, with Emily Parker

Sinan Umu – PhD, with Anthony Poole & Paul Gardner, in partnership with BlueFern

Akshita Wason – PhD, with Juliet Gerrard, in partnership with MacDiarmid

Serena Watkin, BSc (Hons), with Grant Pearce

Michael Weusten – PhD, with Emily Parker

Nicole Wheeler – MSc, with Paul Gardner

Sarah Wilson-Coutts – PhD, with Emily Parker, in partnership with Callaghan Innovation

Amy Yewdall – PhD, with Juliet Gerrard, in partnership with US ARO

GRADUATED OR COMPLETED DEGREE REQUIREMENTS

Neha Chandrasekaran, PhD, Simone Dimartino & Conan Fee, The influence of amino acid properties on the adsorption of proteins and peptides to stainless steel surfaces.

Tammie Cookson, PhD, Emily Parker, Probing the active site of anthranilate phosphoribosyltransferase from *Mycobacterium tuberculosis* to facilitate novel drug development.

Dylan Gifford, MSc, Grant Pearce in partnership with Callaghan Innovation and Anagenix, A Characterisation of Rubisco Activase from Spinach.

Dmitri Joseph, PhD, Emily Parker, Mechanistic and evolutionary analyses of the sialic acid synthase family.

Angela Newton, PhD, Juliet Gerrard, Flavour formation in ghee.

Michael Oliver, BSc (Hons) Renwick Dobson, The first structural investigation of diaminopimelate decarboxylase from plants.

Amy Phillips, PhD, Juliet Gerrard, Structural characterisation of proteins from the peroxiredoxin family

Eric Richards, MSc, Grant Pearce, Characterisation of bioactive proteins present in Actinidia species.

Balaji Somasundaram, PhD, Conan Fee, A surface plasmon resonance assay to determine the effect of influenza neuraminidase mutations on its affinity with antiviral drugs?

Kannan Subramanian, PhD, Juliet Gerrard & Conan Fee, Kinetics of insulin - insulin receptor interaction using a surface plasmon resonance (SPR).

Ryu Toyama, MSc, Emily Parker, Inhibitory studies of Neisseria meningitidis and *Campylobacter jejuni* N-acetylneuraminic acid synthase.

Mark Walker, MSc, Anthony Poole, The function of the TAR1 gene and the evolution of the retrograde response.

Serena Watkin, BSc(Hons), Grant Pearce, Structure and function of Dihydrodipicolinate Reductase.

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PRESENTATIONS

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2014

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H. R. Baron, L. Howe, A. Varsani, R. J. T. Doneley, Disease screening of three breeding populations of adult exhibition budgerigars (*Melopsittacus undulatus*) in New Zealand reveals a high prevalence of a novel polyomavirus and avian malaria infection. *Avian Diseases*, 58, 111–117 (2014).

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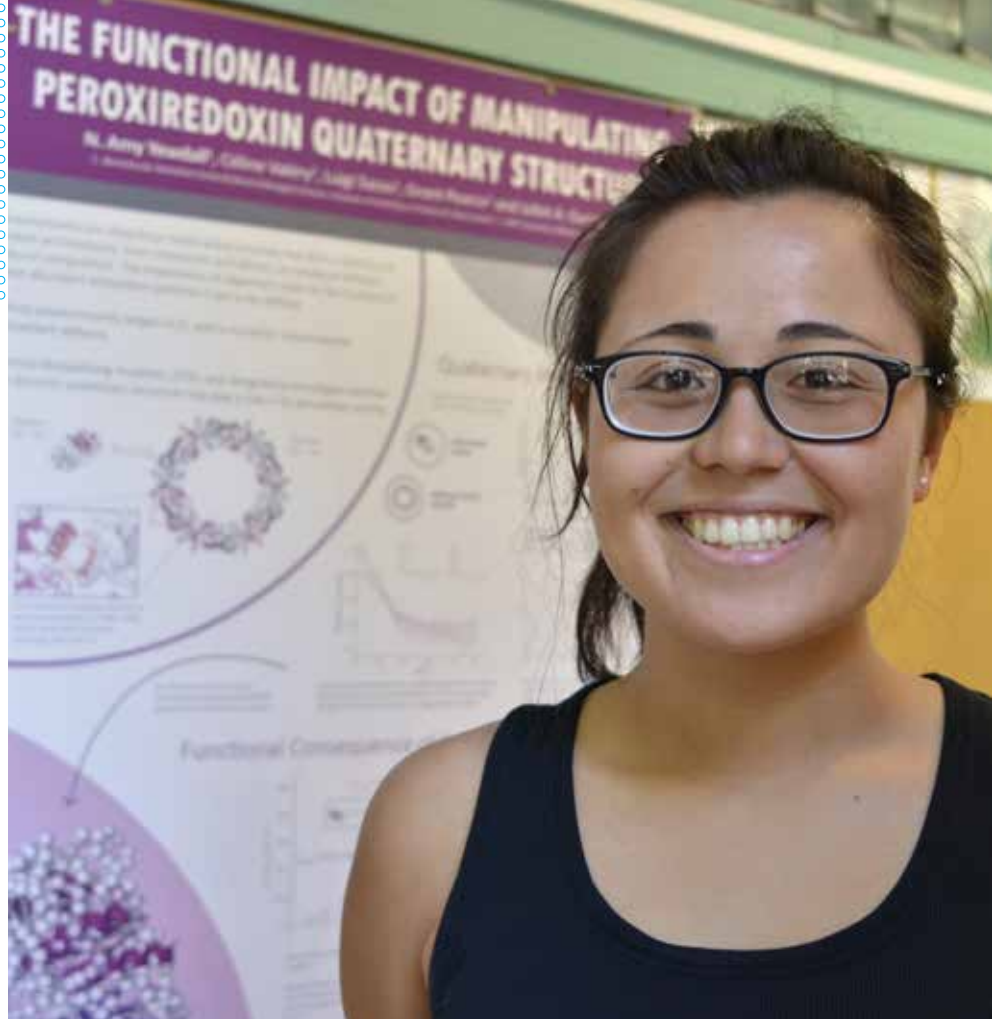
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CONFERENCE POSTERS AND PAPERS

C. Boi, S. Dimartino, M.O Herigstad, J. da Sousa Silva, G.C. Sarti (2014) A comparison between chromatographic stationary phases. 16th Recovery of Biological Products Conference, Rostock, Germany, 27–31 July 2014. (Poster presentation)

N. Chandrasekaran, S. Dimartino, C. J. Fee (2014) Comparative study of dairy protein-associated water and its adsorption effects



Congratulations to Amy Yewdall on her poster prize at the 39th Lorne Conference on Protein Structure and Function Conference.

on stainless steel surfaces by fluorescent labelling and QCM-D. Chemeca 2013, Brisbane, Australia, 29 Sept 2013 – 2 Oct 2013. (Abstract)

J. Crowther, G. B. Jameson, A. Hodgkinson, R. C. J. Dobson (2014) A physicochemical characterisation of caprine beta-lactoglobulin. Protein Structure and Function, Lorne, Australia, 9 – 13 Feb 2014. (Poster presentation)

S. Dimartino, C. J. Fee, S. Nawada, D. Clucas, T. Huber, A. Gordon, F. Dolamore (2014) 3D printing of porous media at the microstructural scale. 16th Recovery of Biological Products Conference, Rostock, Germany, 27–31 July 2014. (Abstract)

S. Dimartino, A. Mather, S. Nawada, M. Haber (2014) Novel flow chamber for the determination of the attachment strength of marine organisms. 2nd International Conference on Biological and Biomimetic Adhesives, Istanbul, Turkey, 6–9 May 2014. (Poster presentation)

K. A. Donovan, S. A. Kessans, F. Peng, T. F. Cooper, R. C. J. Dobson, (2014) Not different, just better: The adaptive evolution of a key glycolytic enzyme. Protein Structure and Function, Lorne, Australia, 9–13 Feb 2014. (Poster Presentation)

C. J. Fee (2014) 3D Printing of Monolithic Columns. Monolith Summer School and

Symposium, Portoroz, Slovenia, 30 May 2014 – 4 June 2014. (Keynote Abstract)

A. Gordon, T. Huber, S. Dimartino, C.J. Fee (2014) Development and modification of cellulose based hydrogels for chromatography. BioProcessing Network Conference, Melbourne, Australia, 21–23 Oct 2014. (Poster presentation)

J. Hermawan, T. S. Loo, G. E. Norris, R. C. J. Dobson, S. A. Kessans, G. B. Jameson (2014) Towards elucidation of the proton-coupled electron-transfer reaction mechanism in manganese superoxide dismutase through disruption of the dimer interface. New Zealand Structural Biology Meeting, Hanmer Springs, 30 June – 2 July 2014. (Poster presentation)

G. B. Jameson, L. M. Kent, T. S. Loo, G. E. Norris, L. D. Melton, D. Mercadante, M. A. K. Williams (2014) Structure of the first natively non-processive pectin methylesterase (from *Aspergillus niger*): comparison to processive orthologues from plants and bacteria. Protein Structure and Function, Lorne, Australia, 9–13 Feb 2014. (Poster presentation)

A. O. Law, A. C. Ravichandran, H. Suzuki, D. G. McEwan, V. Rogov, R. C. J. Dobson, I. Dikic (2014) Molecular mechanism of PlekHM1 – mATG8 family protein conjugation. Protein Structure and Function, Lorne, Australia, 9 –13 Feb 2014. (Poster Presentation)

S. Lindgreen, K. Adair, A. Poole, J. Tylanakis (2014): Heating significantly alters community composition and functioning both above and below ground, Marie Skłodowska-Curie Satellite Meeting, 19–20 June 2014 (Poster presentation)

S. Lindgreen, K. Adair, A. Poole, J. Tylanakis (2014): Heating significantly alters community composition and functioning both above and below ground, ESOF (European Science Open Forum) 2014, 21–26 June 2014 (Poster presentation)

W. Liu, S. U. Umu, R. Catchpole, P.P. Gardner, A. M. Poole (2014) Are genome sizes of bacteria restricted by their regulatory repertoires? Queenstown Molecular Biology Meetings, Queenstown, 25 Aug 2014. (Poster Presentation)

S. Nawada, S. Dimartino, C. J. Fee, (2014) 3D Printing as a tool for investigating imperfections in packed bed microstructures. 16th Recovery of biological Products, Rostock, Germany, 27–31 July 2014. (Poster presentation)

V. Nock, Y. Muller, M. Sellier, C. Verdier (2013) Biochemical Sensing Assays based on Coalescence-induced Self-propulsion Digital Microfluidics. 67-70, 7th International Conference on Sensing Technology, Wellington, 3–5 Dec 2013. (Paper in published proceedings)

R. A. North, S. A. Kessans, H. Suzuki, M. D. Griffin, R. C. J. Dobson (2014) Engineering enzymes to probe novel antibiotic targets within sialic acid catabolism. Protein Structure and Function, Lorne, Australia, 9–13 Feb 2014. (Poster Presentation)

R. A. North, S. A. Kessans, H. Suzuki, M. D. Griffin, R. C. J. Dobson (2014) Probing novel antibiotic targets within sialic acid catabolism. Enzyme Mechanisms by Biological Systems, Manchester, United Kingdom, 1–4 June 2014. (Poster Presentation)

R. A. North, S. A. Kessans, H. Suzuki, M. D. Griffin, R. C. J. Dobson (2014) Probing novel antibiotic targets within sialic acid catabolism. 18th Annual Conference of the Swedish Structural Biology Network, Tällberg, Sweden, 13–16 June 2014. (Poster Presentation)

R. A. North, S. A. Kessans, H. Suzuki, M. D. Griffin, R. C. J. Dobson (2014) Probing novel antibiotic targets within sialic acid

catabolism. 28th Annual Symposium of The Protein Society, San Diego, USA, 27–30 July 2014. (Poster Presentation)

T. Orban, M., Lasse, A.J. Fairbanks, R. C. J. Dobson (2014) Aldehyde-haemoglobin adducts as a biomarker for diabetic complications. MedTech in Christchurch, Christchurch, 18 Dec 2013. (Poster Presentation)

Z. Qiu, L. Tu, X. Xue, T. Zhu, V. Nock, Y. Li, X. Liu, W. Wang (2014) Optogenetic manipulation of freely moving *C. elegans* in an elastomeric environment mimicking and force-measuring chip. 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences, San Antonio, USA, 26–30 Oct 2014. (Paper in published proceedings)

A. C. Ravichandran, H. Suzuki, A. Law, R. C. J. Dobson (2014) Difference in molecular dynamics of LC3A and GABARAP. Protein Structure and Function, Lorne, Australia, 9–13 Feb 2014. (Poster Presentation)

A. C. Ravichandran, H. Suzuki, A. Law, R. C. J. Dobson (2014) Difference in molecular dynamics of LC3A and GABARAP. Ozophagy satellite conference, Melbourne, Australia, 7 Feb 2014. (Poster Presentation)

ORAL PRESENTATIONS

K. L. Adair (2014) Impacts of global change above and below ground, Alan Wilson Centre Annual Meeting, Palmerston North, 29–31 Oct 2014. (Oral presentation)

K. L. Adair, S. Lindgreen, A. Poole, J. Tylanakis (2014) Impacts of global change on soil microbial communities, New Zealand Microbiological Society Meeting, Wellington, 18–21 Nov 2014. (Oral presentation)

M. M. Alkaisi, L. Murray, V. Nock, J. J. Evans (2013) Morphology and differentiation in bioimprinted cells. 12th International Conference on Frontiers of Polymers and Advanced Materials, Auckland, New Zealand, 8–13 Dec 2013. (Oral presentation)

F. Ashari Ghomi, P. P. Gardner, A. M. Poole (2014) Prokaryotic genome annotation, Annual Biology Conference, University of Canterbury, Christchurch, 23 Oct 2014. (Oral presentation)

R. J. Catchpole, J. A. Heinemann, A. M. Poole (2014) Probing the evolutionary origins of bacterial translation initiation using experimental evolution. Origins 2014, Nara,

Japan, 6–11 July 2014. (Oral presentation)

J. Crowther, G. B. Jameson, A. Hodgkinson, R. C. J. Dobson (2014) Searching for Differences in a Mysterious Milk Protein. Annual Biology Conference, Christchurch, 23 Oct 2014 (Oral presentation)

S. Dimartino (2014) 3D Printing of microstructured chromatographic media. BioProcessing Network Conference 2014, Melbourne, Australia, 21–23 Oct 2014. (Oral presentation)

S. Dimartino, A. Mather, S. Nawada, D. Savory, A.J. McQuillan (2014) Comparative study of the bio-adhesives produced from macroalgae. Chemeca 2014, Perth, Australia, 28 Sept – 1 Oct 2014. (Oral presentation)

S. Dimartino, D. M. Savory, A. J. McQuillan (2014) Comparative study of the attachment of Fucales seaweeds from temperate regions of the Southern Hemisphere. 2nd International Conference on Biological and Biomimetic Adhesives, Istanbul, Turkey, 6–9 May 2014. (Oral presentation)

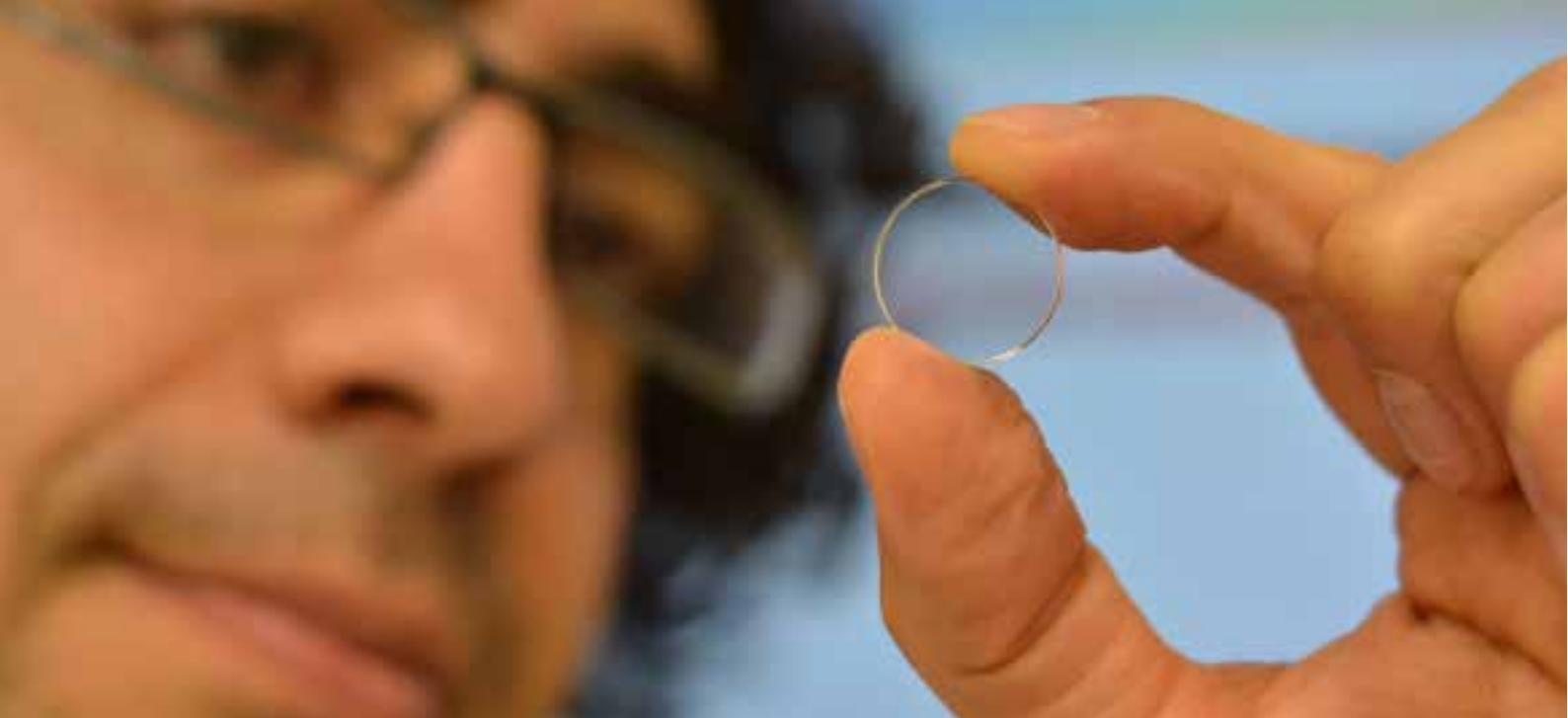
R C. J. Dobson (2014) Enzymes: Dynamics, quaternary structure and evolution. University of Auckland Medical School, Auckland, 5 Dec 2014. (Invited Oral presentation)

R C. J. Dobson, K. A. Donovan, S. A. Kessans, F Peng, T. Zhu, T. F. Cooper (2013) Not different, just better: The adaptive evolution of a glycolytic enzyme. Australian Society for Biophysics Annual Meeting, Melbourne, Australia, 24–27 Nov 2013. (Invited Oral presentation)

R C. J. Dobson, K. A. Donovan, S. A. Kessans, F Peng, T. Zhu, T. F. Cooper (2014) Not different, just better: The adaptive evolution of a glycolytic enzyme. Australian Society for Biophysics Annual Meeting, Melbourne, Australia, 28 Sept – 2 Oct 2014. (Invited Oral presentation)

R. C. J. Dobson, A. Ravichandran, H. Suzuki, K. Tabata, V. Rogov, D. McEwan, P. Wild, A. Law, E. Morita, I. Dikic, S. Wakatsuki (2014) You are what you eat eats: Molecular mechanisms for autophagosome formation. New Zealand Structural Biology Meeting, 30 June – 2 July 2014 (Invited Oral presentation)

K. A. Donovan (2014) Not different, just better: The adaptive evolution of a key glycolytic enzyme. Protein Engineering Canada Conference, Ottawa, Canada, 20–22 June 2014. (Oral presentation)



K. A. Donovan (2014) Not different, just better: The adaptive evolution of a key glycolytic enzyme. Annual Biology Conference, University of Canterbury, Christchurch, 23 Oct 2014. (Oral presentation)

K. A. Donovan (2014) Structural, functional and dynamic analysis of an evolved enzyme. 31st Annual Trent Conference on Mass Spectrometry, Orillia, Canada, 11–14 Aug 2014. (Oral presentation)

H. Eldai, P. P. Gardner (2014) Protein-RNA interaction in the Csr/Rsm global regulatory system. Annual Biology Conference, University of Canterbury, Christchurch, 23 Oct 2014. (Oral Presentation)

G. B. Jameson, L. M. Kent, T. S. Loo, G. E. Norris, L. D. Melton, D. Mercadante, M. A. K. Williams (2014) Molecular moas versus molecular motor-mowers: Processive and non-processive methylesterases. CRYSTAL 29 – meeting of the Society of Crystallographers in Australia and New Zealand, Queensland, Australia, 22–25 April 2014. (Oral presentation)

G. B. Jameson, L. M. Kent, T. S. Loo, G. E. Norris, L. D. Melton, D. Mercadante, M. A. K. Williams (2014) Molecular moas versus molecular motor-mowers: The trimming of pectin by non-processive and processive methylesterases. New Zealand Structural Biology Meeting, Hanmer Springs, 30 June – 2 July 2014. (Oral presentation)

A. O. Law (2014) PlekHM1 encourages autophagosome-lysosome fusion through the LIR motif. Annual Biology Conference, University of Canterbury, Christchurch, 23 Oct 2014. (Oral presentation)

C. M. Lepper, G. B. Jameson, P. J. B. Edwards, M. A. K. Williams (2014) High-pressure/high-temperature NMR studies of RNA and its components: Implications on the origin of life, New Zealand Structural Biology Meeting,

Hanmer Springs, 30 June – 2 July 2014. (Oral presentation)

S. Lindgreen, K. Adair, A. Poole, J. Tylanakis (2014): Heating significantly alters community composition and functioning both above and below ground, University of Copenhagen, 18 June 2014 (Oral presentation)

S. Lindgreen, K. Adair, A. Poole, J. Tylanakis (2014): Effects of global change drivers on above and below ground systems, ISME 15, Seoul, South Korea, 24–29 Aug 2014. (Oral presentation)

W. Liu (2014) Are genome sizes of bacteria restricted by their regulatory repertoires? Annual Biology Conference, School of Biological Sciences, University of Canterbury, Christchurch, 23 Oct 2014. (Oral presentation)

V. Nock (2013) Micro- and nano-engineering for biomedical devices. MedTech in Christchurch, Christchurch, 18 Dec 2013. (Oral presentation)

R. A. North (2014) Probing novel antibiotic targets within sialic acid catabolism. 18th Annual Conference of the Swedish Structural Biology Network, Tällberg, Sweden, 13–16 June 2014. (Invited Oral Presentation)

T. Orban, M. Lasse, A. J. Fairbanks, R. C. J. Dobson (2014) Early detection of diabetic complications. Annual Biology Conference, University of Canterbury, Christchurch, 23 October 2014. (Oral presentation)

E. J. Parker (2013) Turning enzymes on and off: Dynamic protein allostery. Zing Conference on Enzymes, Coenzymes Metabolic Pathways, Mexico, 17–21 Nov 2013. (Oral presentation)

E. J. Parker (2013) Aldolase mechanism, inhibition and allostery. NZIC Conference, Wellington, 1–5 Dec 2013. (Oral presentation)

E. J. Parker (2014) Turning enzymes on and off: Divergent protein allostery. EMBO Enzyme mechanism by biological systems. Manchester, United Kingdom, 1–4 June 2014. (Invited Oral presentation)

E. J. Parker (2014) Turning enzymes on and off: Molecular communication networks. Institute of Molecular Biosciences. University of Queensland, 2 May 2014. (Invited Oral presentation)

E. J. Parker (2014) Examining the allosteric properties of key metabolic enzymes. IUPAB International Union of Pure and Applied Biophysics, Brisbane, Australia, 2–7 Aug 2014. (Oral presentation)

E. J. Parker (2014) Examining, engineering and evolving enzyme regulation. Queenstown Molecular Biology Conference, Queenstown, 25–27 Aug 2014. (Oral presentation)

A. M. Poole (2013) DNA, RNA, Protein, Time. Genetics Otago Symposium. University of Otago, 28–29 November 2013. (Invited Oral Presentation)

A. M. Poole (2014) DNA, RNA, Protein, Time. Earth-Life Science Institute, Tokyo Institute of Technology, 14 February 2014. (Invited Oral presentation)

A. M. Poole (2014) Unraveling the origin of fMet-translation in bacteria via experimental evolution. Society for Molecular Biology & Evolution 2014, San Juan, Puerto Rico (Oral presentation)

A. C. Ravichandran (2014) Self-indulgence for long life. Annual Biology Conference, Christchurch, 23 October 2014. (Oral presentation)

Current grants

External research income continues to grow as BIC develops its research flagships.

Renwick Dobson, Diagnostic markers for diabetic complications, Canterbury Scientific Ltd, \$28,000 (2013–2016).

Renwick Dobson, Growing up milks, AgResearch, \$184,860 (2013–2016).

Renwick Dobson, Mapping the evolution of a key glycolytic enzyme, Marsden Fast-start, \$266,956 (2011–2015).

Renwick Dobson, Not different, just better: The adaptive evolution of an enzyme, US Department of Defense, \$397,591 (2011–2015).

Renwick Dobson, Juliet Gerrard, Antony Fairbanks, Diagnostic markers for diabetic complications, MBIE, \$995,628 (2012–2014).

Renwick Dobson, Hironori Suzuki, Structural and Biochemical Studies of ATG1 Complex, Postdoctoral Fellowship and Scientist Exchange Fellowship Programs in Japan 2012-2013, Royal Society of New Zealand, \$164,000 (2012–2014).

Antony Fairbanks, Doctoral scholarship grant, Callaghan Innovation, \$105,000 (2013–2016).

Conan Fee, Simone Dimartino & Don Clucas, Three dimensional printed adsorptive media, MBIE, \$865,447 (2013–2015).

Paul Gardner, Bioinformatic approaches to functionally characterise RNAs, Rutherford Discovery Fellowship, \$800,000 (2011–2016).

Paul Gardner, Genome assembly, RNA-Seq mapping, genome annotation, identification significant difference between lethal & non-lethal, ESR, \$5,000 (2014–2016).

Sally Gaw, Fate and behaviour of wastewater PCP's in constructed wetlands and on-site land application systems, NIWA, \$30,000 (2013–2017).

Juliet Gerrard, Callaghan Innovation doctoral scholarship grant, Callaghan Innovation, \$191,000 (2012–2015).

Juliet Gerrard, Enhanced protein functionalities, PGP, \$567,300 (2012–2016).

Juliet Gerrard, Industry and Outreach Fellowship, Callaghan Innovation, \$475,002 (2012–2014).

Juliet Gerrard, Manuka Health, \$15,000 (2014).

Juliet Gerrard, Red Meat Combifoods, AgResearch, \$96,720 (2011–2015).

Juliet Gerrard, Riddet Institute, \$414,295 (2008–2015).

Juliet Gerrard, Self assembling peptides as tools to probe the quaternary assembly of proteins, AgResearch, \$76,500 (2012–2015).

Juliet Gerrard, Celine Valéry, Peter Steel, Proteins as supramolecular building blocks for responsive materials and nanodevices, United States Department of Defense, \$417,246 (2012–2015).

Juliet Gerrard, Madhu Vasudevamurthy, Luigi Sasso, Jackie Healy & Susie Meade, Protein nanofibres based biosensors and chromatography beads, MBIE, \$973,669 (2012–2014).

Richard Hartshorn, High strength protein biomaterials through photo-induced crosslinking, AgResearch, \$51,150 (2010–2016).

Wanting Jiao & Emily Parker, New drugs for lung infections in cystic fibrosis, CMRF, \$82,872 (2012–2015).

Wanting Jiao & Emily Parker, Novel strategies for antibiotic design: Targeting histidine biosynthesis in pathogens, Lottery Health, \$85,500 (2013–2016).

Matthew Nicholson & Emily Parker, Fungal factories for manufacture of high value industrial bioproducts, MBIE, \$953,186 (2014-2016).

Rachel North & Ren Dobson, Novel Antibiotic targets within sialic acid catabolism, Maurice & Phyllis Paykel Trust, \$1,500 (2014).

Emily Parker, Controlling the partitioning between the hydrolysis and transglycosylation reactions, Industrial Research Ltd, \$54,000 (2010–2014).

Emily Parker, Development of enzyme inhibitors based on transition state design, Maurice Wilkins Centre, \$15,115 (2014).

Emily Parker, Investigating in inhibition of adenosine triphosphate phosphoribosyltransferase: A potential target for antimicrobial drug design, IRL, \$50,000 (2012–2015).

Emily Parker, Retracing the evolution of enzyme regulation: Understanding the molecular mix-and-match that gives rise to sophisticated control of metabolism, Marsden, \$639,130 (2012–2015).

Emily Parker, The evolution of biosynthesis pathways and metabolism, Subcontract on Vic Arcus led Marsden, \$44,427 (2014–2017).

Emily Parker, Next generation enzymes for chemical transformations, Callaghan Innovation, \$98,875 (2013–2014).

Emily Parker, Next generation enzymes for commercial applications, Subcontract on Vic Arcus led MBIE Smart Idea, \$233,642 (2013–2015).

Emily Parker, Vurucidal action of naturally occurring enzymes found in waste stabilisation ponds, ESR, \$17,000 (2014–2015).

Grant Pearce, Characterisation of enzymes important as nutraceutical additives, IRL, \$35,000 (2012–2014).

Grant Pearce, Why is the most abundant enzyme in the world lacking specificity? Marsden Fast-start, \$266,667 (2010–2014).

Anthony Poole, How does complexity emerge in cellular systems? Rutherford Discovery Fellowship, \$800,001 (2012–2017).

Anthony Poole, Rewiring Life: Addressing the origin of life and improving industrial processes by resurrecting an ancient pathway for DNA synthesis, RSNZ-JSPS Joint Research Project, \$60,000 (2014–2016).

Grants disbursed

BIC supports the development and growth of biomolecular interaction research by funding projects that support our aim to promote excellent, high impact, interdisciplinary and collaborative research. In 2014 we awarded more than \$150k.

Karen Adair, Anthony Poole, Daniel Stouffer & Stinus Lindgreen, Early Career Investigator Research Grant, Using genomics to develop cyanophage-cyanobacteria interaction networks, \$3,000.

Karen Adair, Summer Scholarship Project Grant, Assembly and dynamics of microbial biofilm communities, \$5,000.

Shakil Arif (PhD Supervisor: Emily Parker), Unsupported Postgraduate 2014 Fees Funding, Ancestral α -IPMS reconstruction & their comparison with contemporary enzymes, \$7,000.

Yu Bai (PhD Supervisor: Emily Parker), Unsupported Postgraduate 2014 Fees Funding, Characterisation of the role of gene fusion in enzyme evolution, \$7,000.

David Collings & Anthony Poole, Collaborative Research Grant, Investigating the proteins of the nuclear pore from higher plants to evolutionarily distant algae that contain nucleomorphs, \$6,000.

Deb Crittenden & Antony Fairbanks, Summer Scholarship Project Grant, Protecting group substituent effects on stereoselectivity of glycosylation reactions, \$5,000.

Penel Cross & Emily Parker, Seed Grant, Solving the dysfunction of phenylalanine hydroxylase, \$5,000.

Simone Dimartino & Volker Nock, Flagship

(Engineering Biotechnology) Support Grant, Estimation of the adhesion force of marine organisms on micropatterned topographies, \$6,000.

Ren Dobson, MIBE Near Miss Grant, Diagnostic Markers for Diabetic Complications \$10,000.

Ren Dobson, Seed Grant, Regulation of sialic acid catabolism in *Yersinia pestis*, \$5,000.

Emma Dorsey (MSc Supervisor: Ren Dobson), Unsupported Postgraduate 2014 Fees Funding, Bifunctional enzymes: Can we engineer them? \$3,500.

Paul Gardner & Ren Dobson, Collaborative Research Grant, Avoiding RNA tangles: evolutionary, biophysical and engineering implications, \$6,000.

Mark Hampton & Ren Dobson, Seed Grant, Conformational transformations of the pro-inflammatory protein MIF, \$5,000.

Azadeh Hashemi (PhD Supervisor: Volker Nock), Unsupported Postgraduate 2014 Fees Funding, Engineering materials with bio-inspired topographies, \$7,000.

Janadari Kariyawasam (PhD Supervisor: Richard Hartshorn), Unsupported Postgraduate 2014 Fees Funding, New photoactivated cytotoxins for medical applications, \$7,000.

Sarah Kessans, Seed Grant, Investigating the regulation and evolution of the bifunctional SpoT enzyme in *E. coli*, \$5,000.

Moritz Lasse, Early Career Investigator Research Grant, How does slippage-type editing of RNA polymerase impact proteome outputs? \$3,000.

Emma Livingstone (MSc Supervisor: Emily Parker), Unsupported Postgraduate 2014 Fees Funding, Investigating the short form of ATP-phosphoribosyltransferase: the first enzyme in histidine biosynthesis, \$3,500.

Ken Morison, Summer Scholarship Project Grant, Stability of sensitive products dehydrated by freeze drying, \$5,000.

Mangayarkarasi Nivaskumar, Early Career Investigator Research Grant, Structural characterisation of ChaC proteins from *Arabidopsis thaliana* and *E. coli*, \$3,000.

Volker Nock & Ren Dobson, Flagship (Engineering Biotechnology) Support Grant, Laminar Flow devices for measuring the diffusional coefficients of proteins and protein complexes, \$6,000.

Grant Pearce, MIBE Near-Miss Grant, Kiwifruit proteins promoting digestive health, \$10,000.

Grant Pearce & Andrew Muscroft-Taylor, Seed Grant, Kiwifruit products as antimicrobial agents, \$5,000.

Emily Parker, MIBE Near Miss Grant, Fungal factories for manufacture of high value industrial bioproducts, \$10,000.

Anthony Poole & Jane Allison, Collaborative Research Grant, Molecular dynamics meets deep phylogeny: Generating statistically robust phylogenies from protein structure will improve our understanding of protein structure evolution, \$1,270.

Ayelen Tayagui (PhD supervisors Ashley Garrill & Volker Nock), Unsupported Postgraduate 2014 Fees Funding, \$6,212.

Arvind Varsani & David Collings, Seed Grant, Toward identifying hypovirulence-inducing DNA mycoviruses for biocontrol of plant pathogenic *Sclerotinia sclerotiorum*, \$5,000.

TO ENCOURAGE AND GROW RESEARCH
THAT SUPPORTS OUR VISION

